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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/384,971	08/30/1999	MASAHIKO KUBOTA	35.C13752	8550

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EXAMINER

BROOKE, MICHAEL S

ART UNIT PAPER NUMBER

2853

DATE MAILED: 01/22/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/384,971

Applicant(s)

KUBOTA ET AL.

Examiner

Michael S. Brooke

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 November 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5,9-15 and 19-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5,9-15 and 19-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 2, 9, 21/1 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Shirato et al. (4,339,762).

Shirato et al. teaches an ink jet print head comprising (see Fig. 4) a heat generating layer (403), which discharges ink from an ink discharging port (110). A protective layer (406) is formed over a plurality of heat generating elements. The protective layer has a first region with a substantially uniform thickness along the direction connecting the electrodes and a second region with a substantially uniform thickness along the direction connecting the electrodes, that is thinner than the first region. While the thickness of the heating element changes with its length, at any point there is a substantially uniform thickness. The volume of the ink droplet is changed by varying the voltage (col. 7:66-68 and col. 8:1-3). The second region is provided on a side closer to the orifice (col. 7:27-30 and 55). While Shirato et al. does not specifically teach that the heat generating element has a positive temperature coefficient, resistors made from transition metal borides (HfB_2) inherently have a positive temperature coefficient (see Swinehart, below). Shirato et al. further teaches a grooved plate (102)

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which the Examiner interprets to be the same as the claimed "member for providing said liquid discharge head." Shirato et al. further teaches that the varying thickness of the protective layer changes the amount of heat supplied from position to position on the heating surface (407) (col. 3:63-68 and col. 4:1-11). Figs. 2 and 8 illustrate that the bubble formation begins at the location on the protective layer that has the highest surface temperature (see col. 7:42-68 and col. 8:1-24). Therefore, bubble formation begins in the second region.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shirato et al. (4,339,762), as applied to claims 1, 2, 9, 21/1 and 22 above, and further in view of Shirato et al. (4,392,907).

Shirato et al. teaches the claimed invention with the exception of the protective layer being composed of an upper protective layer and a lower protective layer and the upper protective layer being composed of SiN and a lower protective layer being composed of PSG. The limitations of removing any layer in the second region, forming the second region by forming the upper protective layer after first etching the lower protective layer, and etching with hydrofluoric acid are directed to the method of

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manufacturing the ink jet head and are not seen to be limiting as to the structure of the ink jet head.

Shirato et al. ('907) teaches (Fig. 4) an ink jet head comprising a first protective layer (9) for the purpose of preventing the contact of the heating resistor with the ink, which would lead to the oxidation of the heating resistor and/or the decomposition of the ink (col. 7:50-54). Shirato et al. further teaches that the protective layer may be a single layer structure or alternatively, may be composed of plural layers (col. 8:30-32).

Therefore, Shirato et al. teaches the a protective layer having a single layer structure and a protective layer having a plural layer structure are art recognized equivalents. Because these two structures were art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute a plural layer structure for the single layer structure taught in Shirato et al. ('762).

It would have been an obvious matter of design choice to provide an with upper protective layer being composed of SiN and a lower protective layer being composed of PSG, since the Applicant has not disclosed that this particular combination of passivation materials solves any stated problem or is for any particular purpose and it appears that the invention would function equally well with the passivation layer taught by Shirato et al, as modified.

5. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shirato et al. (4,339,762), as applied to claims 1, 2, 9, 21/1 and 22 above, and further in view of Matsumoto (4,429,321).

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Shirato et al. teaches the claimed invention with the exception of a driving circuit having a plurality of function devices for driving the heat generating elements provided with the substrate.

Matsumoto teaches an ink jet head comprising an epitaxial layer (119) which is a substrate. The substrate contains a plurality of function elements (911) which drive the heat generating elements (105). Integrating the function devices into the substrate provides the advantage of improving printing speed and recording element density (col. 1:26-54).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided in Shirato et al., function elements in the substrate for driving the heat generating elements for the purpose of improving printing speed and density as taught by Matsumoto.

6. Claims 11, 12, 21/11 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shirato et al. (4,339,762) in view of Nakata et al. (EP-764,531).

Shirato et al. teaches the claimed invention, as discussed above, with the exception of a moving member.

Nakata et al. teaches an ink jet print head comprising a moving member (31) for the purpose of directing the propagation of the pressure wave toward the ejection outlet, thereby increasing ejection efficiency, ejection force and ejection speed.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided in Shirato et al., a moving member for the purpose of directing the propagation of the pressure wave toward the ejection outlet,

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thereby increasing ejection efficiency , ejection force and ejection speed as taught by Nakata et al.

7. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shirato et al. (4,339,762) in view of Nakata et al. (EP-764,531), as applied to claims 11, 12, 21/11 and 23 above, and further in view of Shirato et al. (4,392,907).

Shirato et al. teaches the claimed invention with the exception of the protective layer being composed of an upper protective layer and a lower protective layer and the upper protective layer being composed of SiN and a lower protective layer being composed of PSG. The limitations of removing any layer in the second region, forming the second region by forming the upper protective layer after first etching the lower protective layer, and etching with hydrofluoric acid are directed to the method of manufacturing the ink jet head and are not seen to be limiting as to the structure of the ink jet head.

Shirato et al. ('907) teaches (Fig. 4) an ink jet head comprising a first protective layer (9) for the purpose of preventing the contact of the heating resistor with the ink, which would lead to the oxidation of the heating resistor and/or the decomposition of the ink (col. 7:50-54). Shirato et al. further teaches that the protective layer may be a single layer structure or alternatively, may be composed of plural layers (col. 8:30-32). Therefore, Shirato et al. teaches the a protective layer having a single layer structure and a protective layer having a plural layer structure are art recognized equivalents. Because these two structures were art recognized equivalents at the time the invention

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was made, one of ordinary skill in the art would have found it obvious to substitute a plural layer structure for the single layer structure taught in Shirato et al. ('762).

It would have been an obvious matter of design choice to provide an with upper protective layer being composed of SiN and a lower protective layer being composed of PSG, since the Applicant has not disclosed that this particular combination of passivation materials solves any stated problem or is for any particular purpose and it appears that the invention would function equally well with the passivation layer taught by Shirato et al, as modified.

8. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shirato et al. (4,339,762) in view of Nakata et al. (EP-764,531), as applied to claims 11, 12, 21/11 and 23 above, and further in view of Murthy et al. (5,658,471).

Shirato et al. teaches the claimed invention with the exception of the heat generating element being composed of polycrystalline silicon.

Murthy et al. teaches that HfB_2 and polysilicon (polycrystalline silicon) are art recognized equivalents for making a heat generating element (col. 7:1-3). Because these two structures were art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute a polycrystalline silicon heat generating element for the HfB_2 heat generating element taught in Shirato et al. ('762).

9. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shirato et al. (4,339,762) in view of Nakata et al. (EP-764,531), as applied to claims 11, 12, 21/11 and 23 above, and further in view of Matsumoto (4,429,321).

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Shirato et al. teaches the claimed invention with the exception of a driving circuit having a plurality of function devices for driving the heat generating elements provided with the substrate.

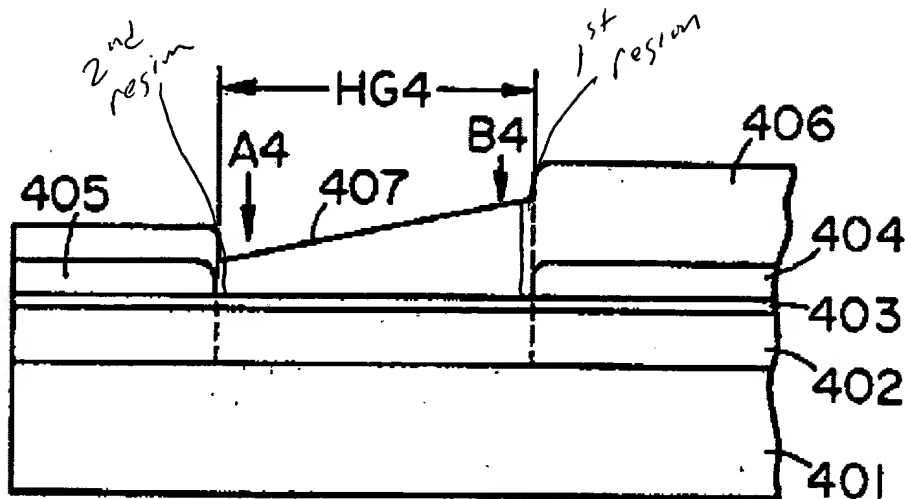
Matsumoto teaches an ink jet head comprising an epitaxial layer (119) which is a substrate. The substrate contains a plurality of function elements (911) which drive the heat generating elements (105). Integrating the function devices into the substrate provides the advantage of improving printing speed and recording element density (col. 1:26-54).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided in Shirato et al., function elements in the substrate for driving the heat generating elements for the purpose of improving printing speed and density as taught by Matsumoto.

Response to Arguments

10. Applicant's arguments filed 11/21/01 have been fully considered but they are not persuasive.

Applicant's argument that Shirato et al. does not teach a first region with a substantially uniform thickness along the direction connecting the electrodes and a second region with a substantially uniform thickness along the direction connecting the electrodes is not persuasive.



As illustrated above, Shirato et al. teaches a first region having a substantially uniform thickness along a direction connecting the electrodes and a second region having a substantially uniform thickness along a direction connecting the electrodes, wherein the second region is thinner than the first region. If one looks at small regions, then the thickness is substantially the same. Therefore, the claimed limitation is met.

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael S. Brooke whose telephone number is 703-305-0262. The examiner can normally be reached on 6:30-300 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E. Barlow can be reached on 308-3126. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-3431 for regular communications and 703-305-3431 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



Michael S. Brooke
January 18, 2002



John Barlow
Supervisory Patent Examiner
Technology Center 2800